Demand Response Enabling Technologies Development

Contract #: 500-01-043
Contractor: University of California, Berkeley
Subcontractors: Ron Hofman Company
Contract Amount: $5,500,000
Contractor Project Manager: Gaymond Yee
Commission Contract Manager: David Michel III (916) 651-9864
Status: Active

Project Description:

The purpose of this project is to help develop demand response (DR) enabling technologies in the medium (3-5 years) and long (5-8 years) term by leveraging on-going RD&D funded in communication, information, and control technologies by other agencies (e.g., the Department of Defense at UCB). This contract will focus on specific energy-related tasks that can lead to dramatic decreases (hopefully by a factor of 10) in the installed cost of these technologies for DR applications.

This contract will also focus on DR capabilities that are more powerful and robust than those identified in a baseline study also proposed under the DR Program Plan for funding but with a different contractor. Initially, this contract will attempt to develop DR-related:

- Micro-electromechanical systems (MEMS) sensors and actuators.
- Open-system, mesh-architecture communication systems that can seamlessly share data.
- Real-time distributed-intelligence device networks that are self-organizing.
- Enterprise-wide multi-level control strategies that can absorb legacy systems.

This project supports the PIER Program objectives of:

- Improving the reliability/quality of California's electricity by reducing service interruptions through expanded service options and new system-wide capabilities.
- Maximizing market connection by reducing the installed cost of energy-related information, communication, and control technologies.
- Improving the energy cost/value of California's electricity by providing real-time information and a means to automatically respond to supply-side problems.

Proposed Outcomes:

1. Research and develop new reference designs for sensors, meters and thermostats that will make the DR infrastructure very cost-effective and compatible with legacy systems. A project at the University of California, Berkeley, began early in 2003 leveraging existing research funded by the Department of Defense and private industry. Four technologies form the basis of this medium- to long-term R&D. The work has the potential of reducing statewide DR implementation costs by a factor of 10 while at the same time increasing functionality also by a factor of 10.

2. Think through, conceptualize and design a suitable real-time demand response business network for California to facilitate and maximize demand response resources within the State. The *California Demand Response Business Network* project is a collaborative research effort between Utility Integrated Solutions, Dynamic Networks, Nexant, and Savvion. This network, which has

been coined as DRBizNet, will be architected using advanced concepts in distributed business network architecture with the goal of enabling real-time collaboration among participants in the DR market in California including customers, utilities, regulators, and service providers (e.g. metering agents, settlement agents, billing agents, demand exchanges. This projected started in early 2004 and is scheduled to be completed by April 2005.

3. Investigate network security and privacy issues for DR-related communications networks. This third project, which just started, is a collaborative effort between CyberKnowledge and the University of California, Berkeley. In the area of sensor networks, little or no work has been performed regarding security. The research team will identify and categorize security concerns and threats and will propose an architecture with strategies, algorithms, and a roadmap to address them.

4. Specify, design, and develop a software interface that will shield the application software from the hardware platform for ad hoc wireless sensors and actuators, or motes. This fourth project has been approved for funding, but has not started. This project will be a collaborative effort between the Electrical Engineering and Computer Science, Mechanical Engineering, and Architecture departments of the University of California, Berkeley. This interface will permit application portability and facilitate software reuse. Whereas the first project above is looking at the sensor network hardware and reducing its cost, this project is looking more at reducing the cost of software development for sensor network hardware.

Project Status:
The project is active and is well on its way in achieving the project goals.